Automated Detection of Potentially Hazardous Near-Earth-Object Encounters

Paul W. Chodas, Steven R. Chesley, Alan B. Chamberlin, and
Donald K. Yeomans (JPL/Caltech)

Over the last two decades, there has been an increasing public and scientific awareness of the impact hazard posed by Near-Earth Objects (NEOs). We have implemented an automatic process for updating orbital solutions for NEOs and detecting those objects that have an Earth collision probability greater than about 1E-6. Since NEO orbits are often very uncertain, nonlinearites can be large, and Monte Carlo methods are therefore used for detecting possible Earth close encounters. Close approach data are collated and analyzed on the impact plane for each encounter. Automation using robust algorithms is essential because of the large number of objects and possible close approaches. This paper will discuss the techniques and algorithms used, and present several examples of asteroids which have been detected to have significantly non-zero probabilities of colliding with the Earth.